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Bat Mites of the Genus *Macronyssus* Kolenati (Acarina, Macronyssidae)[1)]

With 5 Text-figures

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ABSTRACT *Macronyssus shimizui* sp. nov., *Macronyssus murini* sp. nov., *Macronyssus yesoensis* sp. nov. and *Macronyssus hosonoi* sp. nov. are described. The ventral armature of the male of *Macronyssus charusnurensis* (Dusbábek) is illustrated. The host records are presented for *Macronyssus heteromorphus* Duabábek et Radovsky and *Macronyssus japonicus* Radovsky.

The genus *Macronyssus* Kolenati is one of the thriving genera among mesostigmatids parasitic on bats. Some species have medical significance through biting man, and others, because of their host specificity, suggest phylogenetic relations among host bats. So far, however, this interesting group of mites has not been clarified thoroughly. Radovsky (1967) summarized thus far known species of the genus *Macronyssus* Kolenati in his book. Referring to this elaborate work, any acarologist may be convinced that only a small portion of the *Macronyssus* fauna of the world has been properly described.

In Japan, only 4 valid and 2 to 4 anonymous species of *Macronyssus* mites were recorded as summarized in Wada (1977). Recently, Uchikawa (1979) presented 6 species and 7 anonymous species, indicating an abundance of *Macronyssus* mites in this country. The present paper deals with the description of four new species, and with comments on three interesting species.

1. ***Macronyssus shimizui*** sp. nov.

(Fig. 1)

Macronyssus sp.: Uchikawa, 1976, Tsushima no Seibutsu: 841.
Macronyssus rhinolophi: Uchikawa, 1979, Jap. J. sanit. Zool., **30**: 35.

1) The present paper is the tenth part of the series "Studies on Mesostigmatid Mites Parasitic on Mammals and Birds in Japan."

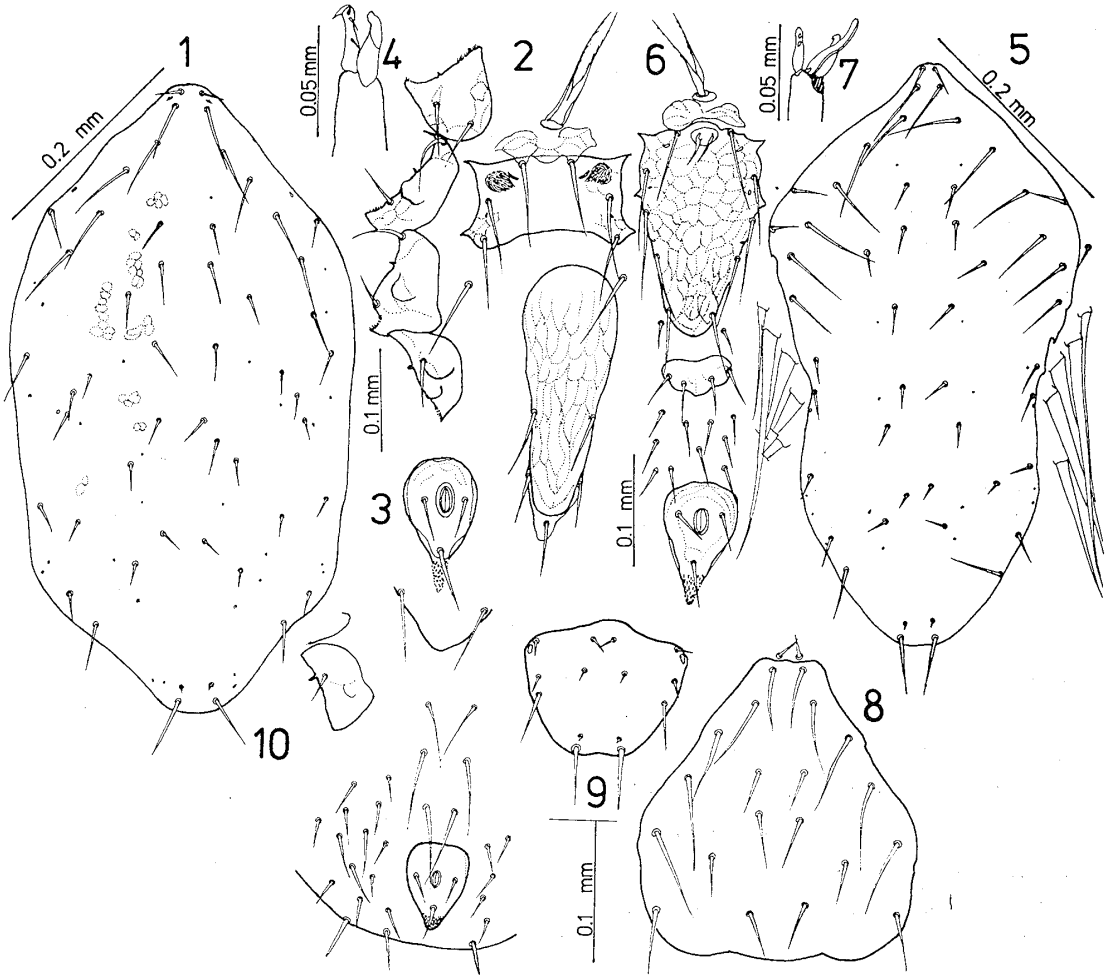

Fig. 1. *Macronyssus shimizui* sp. nov. —— 1, Female dorsal shield; 2, sternal shield, genito-ventral shield and coxae of female; 3, female anal shield; 4, female chelicera; 5, male dorsal shield and long setae; 6, male ventral armature; 7, male chelicera; 8, protonymphal podosomal shield; 9, protonymphal pygidial shield; 10, protonymphal venter.

Female (Fig. 1–1 ~ 4). Dorsal shield 585 μm long by 325 μm wide (holotype), bearing 25–28 setae per side (normal number being 26, inclusive of s_1); z_4-j_4 (Sc-D_3 in Radovsky, 1967) ratio, about 2 to 1. About 40 setae on dorsal soft integument. Sternal glands well developed, with fine striae. Genito-ventral shield with weakly sclerotized extension of tip that bears 3 setae. Anal shield posteriorly tapered. About 100 setae present on ventral soft integument. Coxa I lacking ventral ridge; coxae II–IV with ventral ridges. Fixed and movable chaelae as in Fig. 1–4.

Male (Fig. 1–5 ~ 7). Dorsal shield 460 μm long and 250 μm wide at anterior fourth level, laterally concave, and bearing about 25 pairs of setae; z_4-j_4 ratio, about 2.5 to 1. Five pairs of enlarged, sharply pointed setae flanking dorsal shield at concaved part; lst to 5 th setae 8, 13, 15, 15 and 8 μm wide at bases and

150, 190, 193, 180, 108 μm long, respectively, on the allotype. Ventral armature divided into sterno-genital, ventral and anal shields; sterno-genital shield rounded posteriorly and free from endopodal shield; ventral shield small and bearing 4 setae; anal shield almost rounded anteriorly. About 40–50 setae ventrally on soft integument. Peritreme terminating over coxa II. Coxal ridges as in female.

Protonymph (Fig. 1–8～10). Idiosoma 390 μm long by 240 μm wide. Podosomal shield 220 μm long by 200 μm wide, bearing 10 pairs of setae, with marginal ones being long; z_4-j_4 ratio, 2 to 1. Pygidial shield 90 μm long by 128 μm wide, with convex anterior margin, bearing 7 pairs of setae. Fourteen to 16 pairs of setae, exclusive of j_1, dorsally on soft integument. Sternal shield well sculptured. Three pairs of prominent setae between sternal and anal shields extending beyond bases of successive setae; 16–18 pairs of setae ventrally on soft integument. Ventral ridges strong on coxae II and III, but weak on coxae IV.

Material examined. The holotype female, allotype male, 6 ♀♀, 1 ♂ and 3 protonymphs (PN), Odagiri, Nagano Pref., 29–III–1968; 1 ♂, Shimashima-dani, Nagano Pref., 9–XII–1976; 2 ♀♀, 2 PN, the same locality, 25–III–1977; 1 ♀, the same locality, 20–IV–1977; 1 ♀, 10 PN, the same locality, 8–VI–1977; 1 PN, the same locality, 28–X–1978; 1 ♀, 8 PN, Saitama Pref., date uncertain (coll. Mr. M. Takahashi). The host bat was *Rhinolophus cornutus* Temminck. The other 38 examples comprising 4 ♂♂, 11 ♀♀ and 23 PN from Tsushima, Nagasaki Pref., were examined and already recorded (Uchikawa, 1976).

The holotype and allotype are deposited in the collection of the National Science Museum (Nat. Hist), Tokyo (NSMT–Ac 9310, 9311), and the other specimens in the collection of the author.

Remarks. Macronyssus rhinolophi (Oudemans) in Uchikawa (1979) was proved distinctive as described above. The new mite was allied not to any of the European mites but to the Chinese species, *Macronyssus ventralis* (Wen) parasitic on *Rhinolophus ferrumequinum* Schreber (Wen, 1975). Remarkable differential characteristics can be found in the male dorsal setae and in setation of the protonymph. Five pairs of enlarged dorsal setae are only for the male of the present new species, and 7 pairs of setae on pygidial shield and hypertrichy on opisthonotal venter are characteristic of its protonymph.

The mites obtained, especially adults, were fragile and engorged. Their internal organs with foods were hardly cleared with lactic acid, KOH solution and alcohol. Thus, the morphological accounts presented above were taken from some dissected specimens. The allotype was one of the dissected and partly damaged specimen. Although a considerable number of specimens had been taken, they were not designated as paratypes because of poor conditions.

The new species was named after the late Dr. Mitsuo Shimizu, the former Professor of the Department of Biology, Faculty of Education, Shinshu University, to give a profound homage to his memory.

2. ***Macronyssus murini*** sp. nov.

(Fig. 2)

Macronyssus sp. 2: Uchikawa, 1979, Jap. J. sanit. Zool., **30**: 35.

Female (Fig. 2–1～3). Measurements were taken from the holotype and 2 paratypes. Idiosoma 575 (555–510) μm long by 350 (340–310) μm wide. Dorsal shield 520 (510–505) μm long by 260 (250–255) μm wide, bearing 27 pairs of setae; z_4–j_4 ratio, 3–3.5 to 1. About 60 setae dorsally on soft integument. Sternal shield 58 (50–53) μm long and 145 (135–145) μm wide at level of 2nd sternal setae, with prominent antero-lateral and very weak postero-lateral projections; posterior margin concave to level of 2nd slits. Sternal glands lacking. Genito-ventral shield with weakly sclerotized, caudal tip bearing 1–2 setae. Anal shield 70 (65–73) μm long from anterior margin to base of postanal setae and 70 (70–60) μm wide. Ventral soft integument heavily covered with strong setae. Peritreme extending over anterior third of coxa I. Ventral ridges on coxae as illustrated

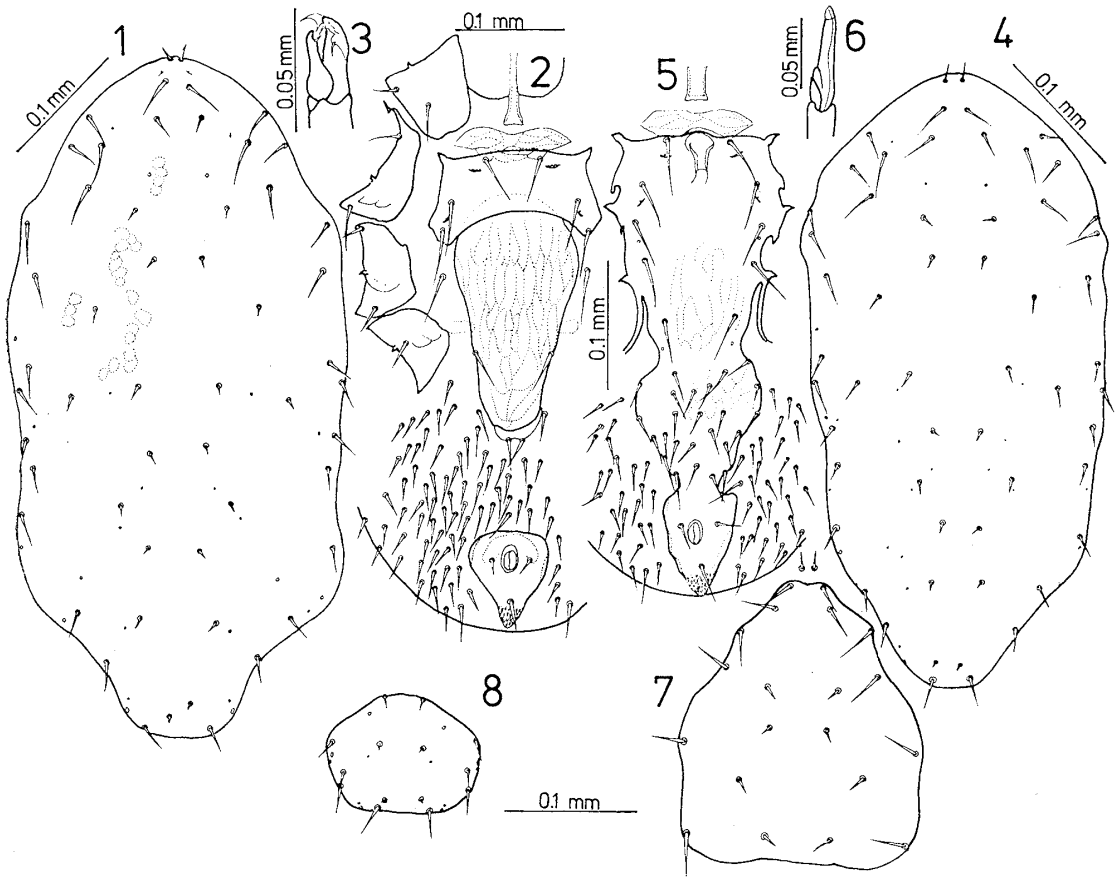

Fig. 2. *Macronyssus murini* sp. nov. —— 1, Female dorsal shield; 2, female venter; 3, female chelicera; 4, male dorsal shield; 5, male venter; 6, male chelicera; 7, protonymphal podosomal shield; 8, protonymphal pygidial shield.

in Fig. 2–2. Legs rather short; legs I and II distinctly thicker than legs III and IV.

Male (Fig. 2–4～6). The measurements were taken from the allotype and 2 paratypes. Dorsal shield 410 (426–425) μm long by 235 (230–230) μm wide, covering almost whole dorsum, bearing 28 pairs of setae; z_4–j_4 ratio, 3.1–3.7 to 1. About 15 pairs of setae dorsally on soft integument. Holoventral shield with 3 pairs of lateral projections in sterno-genital region, with 3rd ones being joined to endopodal shields; lateral margin irregular between lst and 2nd projections; gastric setae more than 20; constriction anterior to anal portion. Fixed and movable digits minute; supermadactyl well developed, 72 (68–68) μm long.

Protonymph (Fig. 2–7～8). Podonotal shield 200–207 μm long by 170–178 μm wide; submedian setae minute; z_4–j_4 ratio, 3.3 to 1. Pygidial shield 78–85 μm long by 102–115 μm wide, bearing 7 pairs of setae. Eleven pairs of setae, exclusive of j_1, present dorsally on soft integument. Sternal shield 125–128 μm long by 95–98 μm wide. Four pairs of setae between sternal and anal shields, and a pair of caudal setae on soft integument.

Material examined. Holotype female, allotype male, 2 pairs of male and female paratypes, 4 ♀♀, 1 male deutonymph and 8 PN ex *Murina leucogaster hilgendorfi* Peters, Hakkoda, Aomori Pref., 11–IX–1970 (coll. Dr. K. Maeda); 1 ♀, 1 PN from the same host, Rikuzen-Takada City, Iwate Pref., date uncertain; 1 ♂, 1 ♀, 1 PN ex *Murina aurata ussuriensis* Ognev, Nagiso, Nagano Pref., date uncertain (coll. Dr. W. Miyata); 2 PN, Aizankei, Hokkaido, IX-1954 (coll. Dr. Inoue), 1 PN, Mt. Yatsugatake, 6–VIII–1967 (coll. Miss M. Yoshiyuki), and 1 PN, Mt. Fuji, VI–1978 (coll. Dr. M. Harada) from the same host.

The holotype and allotype are deposited in the collection of the National Science Museum (Nat. Hist.), Tokyo (NSMT–Ac 9312, 9313), and the paratypes and all the other specimens in the collection of the author.

Remarks. Macronyssus murini sp. nov. is separable from all the known species of the genus by combination of the enlarged spermadactyl slightly longer than the 2 nd cheliceral segment, 27 (♀) and 28 (♂) pairs of setae on the dorsal shield, z_4–j_4 ratio more than 3 to 1, absence of sternal glands and number of setae dorsally on soft integument.

3. ***Macronyssus yesoensis*** sp. nov.

(Fig. 3)

Macronyssus sp. 5: Uchikawa, 1979, Jap. J. sanit. Zool., **30**: 35.

Female (Fig. 3–1～3). Measurements were taken from the holotype, paratype and the other 3 specimens. Idiosoma about 640×400 μm. Dorsal shield 545 (540–570) μm long by 255 (250–270) μm wide, bearing 28 pairs of setae (J_4 present); z_4–j_4 ratio, 2.1–2.5 to 1. About 40 setae per side dorsally on soft integument. Sternal shield 55 (55–58) μm long by 125 (130–143) μm wide; posterior margin distinctly concave; 4 cell-like sculptures close to first slit but lacking sternal

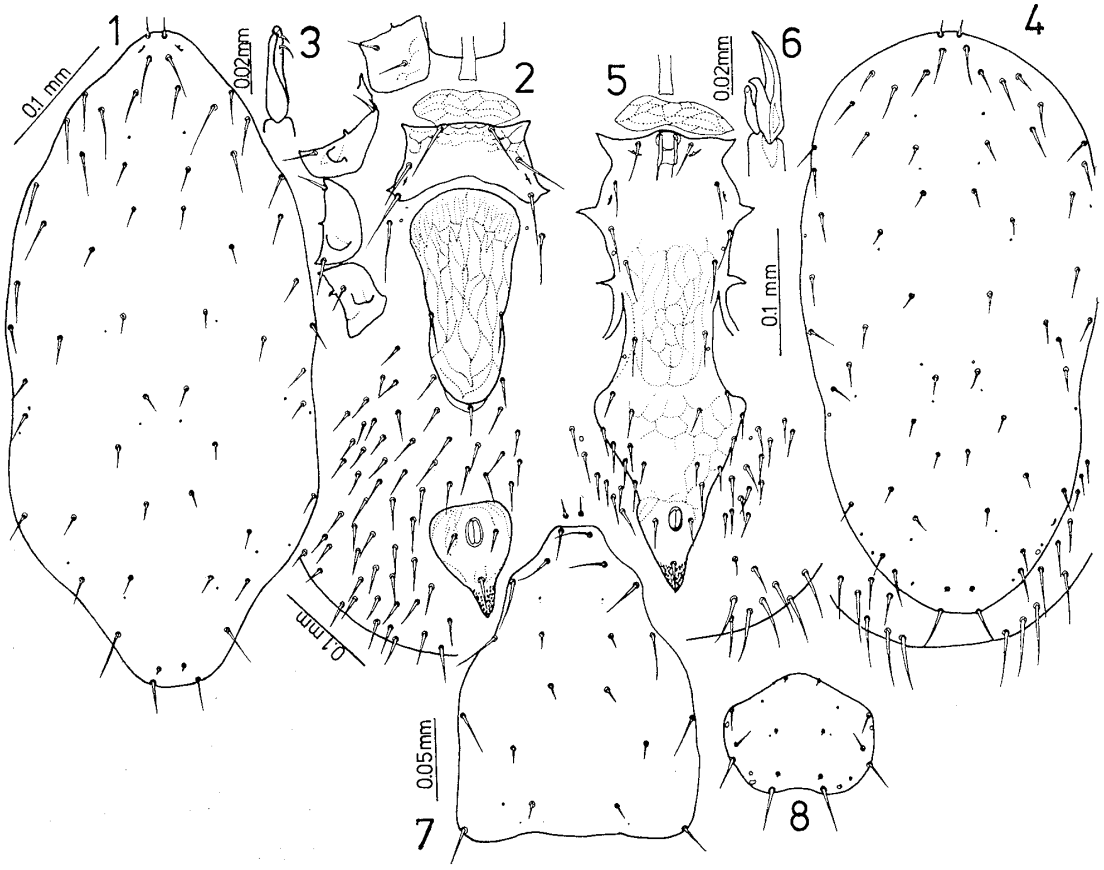

Fig. 3. *Macronyssus yesoensis* sp. nov. —— 1, Female dorsal shield; 2, female venter; 3, female chelicera; 4, male dorsal shield; 5, male venter; 6, male chelicera; 7, protonymphal podosomal shield; 8, protonymphal pygidial shield.

glands; first sternal setae not reaching posterior margin. Genito-ventral shield with weakly sclerotized tip bearing a seta. Anal shield 75 (63–73) μm long from anterior margin to base of postanal seta and 80 (73–78) μm wide. Ventral ridges prominent on coxae II–IV. About 65 strong setae ventrally on soft integument. Peritreme terminating over coxa I.

Male (Fig. 3–4~6). Measurements were taken from the allotype and 3 paratypes. Idiosoma 540 (490–520) μm by 345 (310–330) μm wide. Dorsal shield 480 (460–510) μm long 230 (225–270) μm wide, with 29 pairs of setae; z_4–j_4 ratio, 2.4–3.5 to 1. About 17 pairs of setae dorsally on soft integument, inclusive of 4–5 pairs of long caudal setae. Holoventral shield with 3 pairs of prominent lateral projections in sterno-genital region; 3rd projections fused to endopodal shields; 15–18 gastric setae present; constriction between ventral and anal regions usually weak. Twelve to 16 pairs of short setae close to gastro-anal region of holoventral shield and about 8 pairs of long caudal setae present. Spermadactyl 33–36 μm long. Peritreme terminating over middle of coxa II.

Protonymph (Fig. 3-7~8). Measurements were taken from 5 specimens. Idiosoma 360–390 μm long by 240–245 μm wide. Podosomal shield 178–190 μm long by 130–158 μm wide; z_4–j_4 ratio, 2.8–3.4 to 1. Pygidial shield 65–78 μm long by 97–105 μm wide, bearing 7 pairs of setae. Eleven pairs of setae, exclusive of j_1, present dorsally on soft integument. Four pairs of setae on gastric soft integument, and a pair of caudal setae present. Ventral ridges prominent on coxae II and III.

Material examined. Holotype female, paratype female, allotype male, 3 paratype males, 25 ♀♀, 14 ♂♂ and 111 PN ex *Eptesicus parvus* Kishida, Koshimizu Town, Hokkaido, 4–VIII–1974; 1 ♂, 1 PN, Okedo, Hokkaido (coll. Dr. K. Maeda) and 1 ♂, 1 ♀, Tennin-kyô, Hokkaido, 25–VI–1967 (coll. Dr. K. Maeda), from *Myotis mystacinus* Kuhl; 1 PN ex *Myotis daubentoni* Kuhl, Memanbetsu, Hokkaido (coll. Dr. K. Maeda); 1 ♂ ex *Myotis hosonoi* Imaizumi, Ontake, Gifu Pref., 13–VI–1970 (coll. Dr. K. Maeda).

The holotype and allotype are deposited in the collection of the National Science Museum (Nat. Hist.), Tokyo (NSMT–Ac 9314, 9315), and the other types in the collection of the author.

Remarks. *Macronyssus yesoensis* sp. nov. is very close to *Macronyssus crosbyi* (Ewing et Stover), which is distributed in wide range from Alaska to Brazil, exhibiting the vast morphological variation (Radovsky, 1967). The female and protonymph of the new species are hardly separable from corresponding stages of *M. crosbyi* from its northern range. However, the male of the new species has the holoventral shield with 3 lateral projections. This is a remarkable property that is not found on *M. crosbyi.* At present, *M. crosbyi* is suggested as a species complex (Radovsky and Beck, 1971), and is left to a thorough study. The present author dared to separate *M. yesoensis* sp. nov. from *M. crosbyi* based on the above male property. Some attempts are necessary to solve nebulous state of a species.

The specimens examined in the present study are mostly from *Eptesicus parvus,* but several individuals were found on fur specimens of *Myotis* bats deposited in the collection of Dr. Kishio Maeda. Postmortem transfer of mites to strange host or hosts could not be denied.

4. ***Macronyssus hosonoi*** sp. nov.

(Fig. 4)

Macronyssus sp. 5: Uchikawa, 1979, Jap. J. sanit Zool., **30**: 35.

Female (Fig. 4-1~4). Measurements were taken from the holotype and paratype. Idiosoma 630–690 μm long by 460–430 μm wide. Dorsal shield 570–535 μm long by 300–275 μm wide, bearing 30 pairs of setae, and broadly rounded posteriorly; all setae but subterminal setae J_5 well developed, and z_4–j_4 ratio, 1.3–1.4 to 1; setae j_2 situated close to each other. Dorsal soft integument covered heavily with about 60 setae per side. Sternal shield much wider than

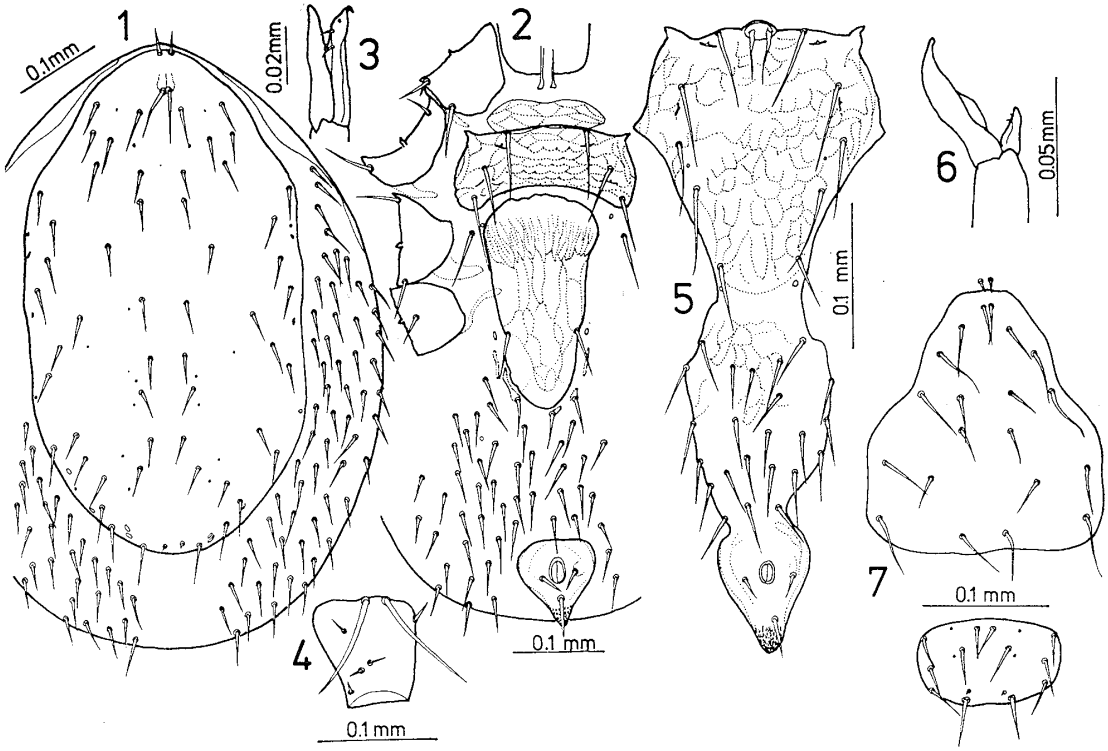

Fig. 4. *Macronyssus hosonoi* sp. nov. —— 1, Female dorsum; 2, female venter; 3, female chelicera; 4, female femur I; 5, holoventral shield; 6, male chelicera; 7, protonymphal podosomal and pygidial shields.

long, 65–55 μm long by 190–185 μm wide; sternal glands indiscernible. Genito-ventral shield lacking weakly sclerotized posterior tip. Anal shield 73–70 μm long from anterior margin to base of postanal seta and 75–75 μm wide. Ventral ridges not prominent on any coxa. Setae ad_1 and pd_1 on femur I very strong as illustrated in Fig. 4–4. Peritreme short, terminating over middle of coxa II; peritrematal shield enlarged on dorsum.

Male (Fig. 4–5$\sim$6). Dorsal shield 425–460 μm long by 230–255 μm wide, bearing 29 pairs of setae and broadly rounded posteriorly; z_4–j_4 ratio, 1.3–1.5 to 1; setae j_2 as in female. About 40 setae per side on soft integument. Holoventral shield with 2 pairs of lateral projections; gastric setae numbering 22–23. About 15 setae per side ventraly on soft integument. Spermadactyl enlarged, about 65 μm long and slightly longer than 2nd cheliceral segment. Other structures as in female.

Protonymph (Fig. 4–7). Idiosoma 425–430 μm long by 255–285 μm wide. Podosomal shield 200–218 μm long by 173–200 μm wide; z_4–j_4 ratio, 1.4–1.5 to 1. Pygidial shield 60–73 μm long by 105–123 μm wide, with 6 pairs of long and a pair of minute setae; anterior margin almost flat; sculpture of the shield distinct. Eleven pairs of setae, exclusive of j_1, dorsally on soft integument, and usual 5

pairs of setae on venter.

Material examined. Holotype female, allotype male, a pair of male and female paratypes, 3 ♀♀, 2 ♂♂, 5 PN and a larva ex *Myotis hosonoi* Imaizumi, Hokujo Village, Nagano Pref., 23–IX–1951; 1 ♀, Okedo, Hokkaido, 26–VII–1972, 2 ♀♀, Sarobetsu, Hokkaido, 14–VII–1971, and 1 ♀, Memanbetsu, Hokkaido, 25–VI–1971, from *Myotis mystacinus* Kuhl (coll. Dr. K. Maeda); 1 ♂, 2 ♀♀, Tennin-kyô, Hokkaido, 10–VIII–1970, 4 ♀♀, Okedo, Hokkaido, 26–VII–1971, from *Myotis ikonnikovi* Ognev (coll. Dr. K. Maeda); 1 ♀, *Barbastella leucomelas darjelingensis* Hogson, Okedo, Hokkaido, 27–VII–1972 (coll. Dr. K. Maeda).

The holotype and allotype are deposited in the collection of the National Science Museum (Nat. Hist.), Tokyo (NSMT–Ac 9316, 9317), and all the other specimens in the collection of the author.

Remarks. *Macronyssus hosonoi* sp. nov. possesses conspicuous characteristics. The dorsal shield with almost evenly developed setae and broadly rounded posterior margin is not common among the members of the genus *Macronyssus*. The setae j_2 situated close to each other are also characteristic of the new mite. The pygidial shield with the flat anterior margin and 6 pairs of long setae on it are particular ones only for the protonymph of *M. hosonoi* sp. nov.

The new mite was named again after the late Mr. Atsushi Hosono, an excellent naturalist who contributed towards clarification of the fauna of Japan.

5. ***Macronyssus charusnurensis*** (Dusbábek)

(Fig. 5)

Ichoronyssus charusnurensis Dusbábek, 1966, Mitt. Zool. Mus. Berlin, **42**: 44.
Macronyssus sp. 7: Uchikawa, 1979, Jap. J. sanit. Zool., **30**: 35.

This species was described as a parasite of *Myotis daubentoni* Kuhl from Mongolia (Dusbábek, 1966). Dr. Dusbábek personally communicated to the present author the occurrence of the mite in Japan. As the ventral structure of the male was somewhat differently described and drawn in the original description (Dusbábek, 1966, fig. 7), a revised figure based on Japanese specimens and confirmed through examination of the paratype was presented as in Fig. 5. The ventral armature was entire with very weakly sclerotized area at the level of coxae IV.

Material examined. One ♂, 5 ♀♀, 10 PN, Memanbetsu, Hokkaido, 25–VI–1971, 1 ♂, 11 PN, Sarobetsu, Hokkaido, 31–VIII–1970, 1 ♀, 1 PN, Nukabira, Hokkaido, VII–1966 from *Myotis daubentoni* Kuhl (coll. Dr. K. Maeda); 2 ♀♀ ex *Myotis mystacinus* Kuhl, Sarobetsu, Hokkaido, 8–IX–1970 (coll. Dr. K. Maeda); 1 ♂ ex *Myotis ikonnikovi* Ognev, Okedo Hokkaido, 26–VII–1971 (coll. Dr. K. Maeda); 4 ♂♂, 3 ♀♀, 15 PN ex *Myotis frater* Allen, Sarobetsu, Hokkaido, (coll. Dr. K. Maeda); 5 ♂♂, 7 ♀♀, 65 PN ex *Eptesicus parvus* Kishida, Koshimizu Town, Hokkaido, 14–VII–1974.

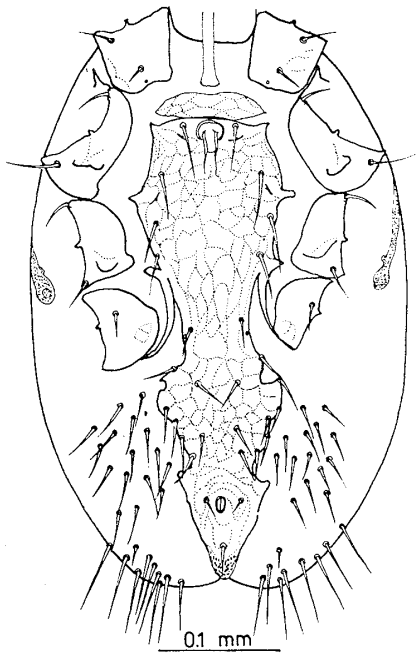

Fig. 5. *Macronyssus charusnurensis* (Dusbábek), male venter.

6. ***Macronyssus heteromorphus*** Dusbábek et Radovsky

Macronyssus heteromorphus Dusbábek et Radovsky, 1972, J. med. Ent., **9**: 525.
Macronyssus sp. 6: Uchikawa, 1979, Jap. J. sanit. Zool., **30**: 35.

This species characterized by modification of the male dorsal shield and caudal setae was described on the series of specimens taken from one of the eight specimens of *Rattus norvegicus* Berkenhout on Shikotan Island close to Hokkaido. On describing the species, Dusbábek and Radovsky (1972) regarded the host association of the mite being incidental and abnormal. In the present study, the host records were added as below.

Material examined. One ♂, 2 ♀♀, 4 PN, Okedo, Hokkaido, 27–VII–1972, 1 ♂, 4 PN Memanbetsu, Hokkaido, 27–VII–1972, 1 ♂, 4 PN, Memanbetsu, 25–VI–1971 and 6 PN, Sarobetsu, Hokkaido, 8–XI–1970, from *Myotis mystacinus* Kuhl; 1 ♂, 2 PN, Okedo, Hokkaido, 26–VII–1971, and 7 PN, Tennin-kyô, Hokkaido, 10–VII–1970, from *Myotis ikonnikovi* Ognev. All the above specimens were taken from the fur specimens deposited in the collection of Dr. Kishio Maeda.

7. ***Macronyssus japonicus*** Radovsky

Macronyssus japonicus Radovsky, 1967, Univ. Calif. Publ. Ent., **46**: 134: Uchikawa, 1979, Jap. J. sanit. Zool., **30**: 35.

The mite is known only from the female and protonymph from an anonymous

Myotis bat taken at Nikko, Tochigi Prefecture. Radovsky (1967) mentioned, *en passant,* that specimens of *Macronyssus granulosus* (Kolenati) were seen with the same collection data with that of *M. japonicus* Radovsky. *M. granulosus* is the mite so far found very commonly on *Myotis macrodactylus* Temminck and often on *Myotis nattereri* Kuhl. There is, however, no record of *M. japonicus* from these two bats. Further collections are necessary to determine true host of the mite. Here is a single female from the identified bat as presented below.

Material examined. One ♀, ex *Myotis pruinosus* Yoshiyuki, near Ishibuchi dum, Iwate Pref., 13–VIII–1969 (deposited in the collection of the National Science Museum (Nat. Hist.), Tokyo.

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REFERENCES

Dusbábek, F., 1966. A contribution to the knowledge of parasitic mites from Mongolia (Acarina: Gamasides). *Mitt. Zool. Mus. Berlin.,* **42**: 43–58.

——— and F. J. Radovsky, 1972. *Macronyssus heteromorphus* (Acarina: Macronyssidae), a new species from the Kuril Islands. *J. med. Ent.,* **9**: 575–579.

Radovsky, F. J., 1967. The Macronyssidae and Laelapidae (Acarina: Mesostigmata) parasitic on bats. *Univ. Calif. Publ. Ent.,* **46**: 1–288.

——— and A. J. Beck, 1971. A new *Macronyssus* species, parasitic on the silver-haired bat in North America. *Acarologia,* **18**: 30–35.

Uchikawa, K., 1976. Acarine parasites of bats in Japan——results of a survey carried out on Tsushima, Nagasaki Prefecture. *Tsushima no Seibutsu,* 839–844. (In Japanese.)

——— 1979. A preliminary report on Japanese bat Macronyssidae. *Jap. J. sanit. Zool.,* **30**: 35. (In Japanese.)

Wada, Y. 1977. Record of mites and ticks parasitic on bats in Japan. *In* Sasa, M. and Aoki, J. (ed.), *Contributions to Acarology in Japan,* pp. 405–414. Zukan-no-Hokuryukan, Tokyo.

Wen Tin-Whar, 1975. The genus *Ichoronyssus* Kolenati, with description of a new species (Gamasides: Macronyssidae). *Acta ent. Sinica,* **18**: 347–352. (In Chinese with English summary.)